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Via Electronic Filing

October 10, 2016

Marlene H. Dortch, Esq.  
Secretary  
Federal Communications Commission  
445 12th Street, S.W.  
Washington, DC 20554

**Re: Written *Ex Parte* Presentation in RM-11681; IB Docket Nos. 12-340 and 11-109;  
and IBFS File Nos. SES-MOD-20151231-00981, SAT-MOD-20151231-00090, and  
SAT-MOD-20151231-00091**

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Dear Ms. Dortch:

Garmin International, Inc. ("Garmin") hereby submits this *ex parte* report in response to the letter filed on behalf of Ligado Networks LLC ("Ligado") on September 8, 2016, in the above-captioned dockets ("September 8, 2016 Letter"). As more fully described below, based on previous RTCA analysis, Ligado's proposed "exclusion zone" approach does not meet the requisite safety needs for certified aviation devices. Thus, Garmin urges the FCC to look to the FAA for establishment of the appropriate course to avoid harmful interference to such devices.

Ligado's letter reports on its representatives' discussion with Commission representatives and Ligado's discussion with FAA staff on Ligado's proposed process for working to ensure protection of certified aviation GPS receivers. Both in text and attachments, Ligado describes an assessment of exclusion zones "based on a 'standoff cylinder' with a horizontal radius of 250 feet from the base station and extending to a height of 30 feet above the base station's antenna." (See September 8, 2016 Letter at 2 & Attachment A.) The "assessment" would then utilize an unspecified model to evaluate an appropriate power limit to ensure "the received power at all points at or beyond the standoff cylinder's surface is below the interference threshold established by the FAA's DO-229D mask . . . ." (See September 8, 2016 Letter at 2.)

In an evaluation of a system proposed by Ligado's predecessor, RTCA, Inc.'s Tactical Operations Committee ("TOC") had studied the use of "exclusion zones," following up on an October 2014 request from the FAA.<sup>1</sup> In its report, RTCA, Inc. explained that it evaluated the

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<sup>1</sup> Letter of Jim Bowman, Co-Chair, TOC, RTCA, Inc., to Elizabeth L. Ray, VP, Mission Support Services, Air Traffic Organization, FAA, dated July 29, 2015, transmitting RTCA Tactical Operations Committee, "GPS Adjacent Band Compatibility: Feedback on Exclusion Zones," July 2015 ("RTCA/TOC Report") (the RTCA/TOC Report is available at <http://www.rtca.org/files/Final%20TOC%20GPS%20ABC.pdf>); Letter of Richard Jennings, Acting Assistant Manager, Design, Manufacturing, and Airworthiness Division, FAA, to Margaret Jenny, President, RTCA, Inc., dated Oct. 7, 2014, which had transmitted FAA, Spectrum Engineering Service, "FAA GPS Adjacent-Band Compatibility Study Methodology and Assumptions,"



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aviation "safety and operational impact of proposed Exclusion Zones, which are 500-foot [radius] cylinders around GPS adjacent band transmission towers within which GPS accuracy may be compromised."<sup>2</sup> Thus, Ligado's proposed exclusion zone cylinder with a radius of 250 feet is half that considered in the RTCA/TOC evaluation.

First, the RTCA/TOC concluded that the proposed exclusion zones in that case with a 500-foot radius had "negative impacts to both flight safety and operations for multiple operational scenarios and multiple types of operators."<sup>3</sup> The report said that "[t]his includes negatively impacting GPS-based TAWS/HTAWS alerts. Additionally, the exclusion zones are defined to go as low as 100 feet AGL [above ground level], but there are some operational scenarios with negative impacts below 100 feet AGL."<sup>4</sup>

Second, although the exclusion zones evaluated by the RTCA/TOC involved a 500-foot radius, the group also said "[t]here is no 'one-size-fits-all exclusion zone' definition of an Exclusion Zone that works everywhere in the National Airspace System (NAS)."<sup>5</sup> The RTCA/TOC said the appropriate size would vary based on operational scenarios:

The use of radio spectrum needs to be evaluated against the different NAS use cases based on the proponent's spectrum signature and density of deployment in various environments. On a case by case basis, a particular definition of an exclusion zone may be acceptable in terms of operations and safety. The dimensions of new zones, their location, and density need to relate to the specific operational scenarios and the impact on aviation safety.<sup>6</sup>

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Oct. 3, 2014 ("FAA GPS/ABC Study"). At page 19 of the FAA GPS/ABC Study, the FAA posed three questions related to operational concerns with exclusion zones that it requested RTCA study.

<sup>2</sup> RTCA/TOC Report at 3.

<sup>3</sup> *Id.* at 4.

<sup>4</sup> *Id.* "TAWS" are Terrain Avoidance Warning Systems, which alert a pilot as the aircraft he or she is flying gets too close to terrain. "HTAWS" are Helicopter Terrain Avoidance Warning Systems. *See id.* at 15. Adverse operational impact to helicopter and general aviation fixed wing operations are outlined on pages 9-10 and 14, respectively, of the RTCA/TOC Report.

Further, the effectiveness of the use of exclusion zones as protection against interference to GPS certified aviation devices is still an open question for several reasons. First, as the RTCA/TOC Report noted, exclusion zones will not be charted, either on paper or electronically, meaning aircraft operators will not have adequate information about them. Second, exclusion zones will not be part of Flight Management System navigation databases. Third, there is no guarantee that TAWS equipment and HTAWS equipment will have an obstacle database or that an obstacle database will include exclusion zones. Even if a database does include such zones, no information exists as to the frequency at which the obstacle data base will be updated with respect to changes to the exclusion zones. *Id.* at 7.

<sup>5</sup> *Id.* at 4.

<sup>6</sup> *Id.* Among the operational scenarios that the RTCA/TOC said could occur in close proximity to towers were EMS, law enforcement, and firefighting. *Id.* at 9.





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(The report did note that Ligado's predecessor had proposed a "significantly smaller proposal" for exclusion zones in which GPS would be compromised; the RTCA/TOC did not evaluate that even smaller alternative. *Id.* at 3 n.2)

Even if appropriately sized exclusion zones could be defined and established, something RTCA/TOC was unable to recommend, no agreement exists on the path loss models to be used in the second step of determining the power limits to apply to Ligado's 10,000 to 20,000 base stations in the certified aviation context. The FAA proposed an approach to path loss modelling to be used for adjacent band compatibility assessment.<sup>7</sup> This approach was referred to RTCA for evaluation.<sup>8</sup> RTCA accepted the FAA's approach to path loss modelling with minor adjustment.<sup>9</sup> Ligado's predecessor was the only RTCA member to disagree with the model, and it provided a separate report noting a number of fundamental differences between its approach and the FAA's approach to path loss modeling, the latter of which the RTCA experts had generally accepted.<sup>10</sup>

As far as Garmin is aware, the FAA has not expressed approval or agreement with the proposal to use exclusion zones of 250 feet in radius set forth in the Ligado September 8, 2016 Letter. As the RTCA/TOC Report makes clear, this one size is not likely to be adequate for protecting certified aviation devices from harmful interference. Garmin is also unaware of any agreement between the FAA and Ligado for determining appropriate path loss models to guide any interference evaluation utilizing exclusion zones.

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<sup>7</sup> FAA GPS/ABC Study at § 2.2 & Appendix B.

<sup>8</sup> Letter of Richard Jennings, Acting Assistant Manager, Design, Manufacturing and Airworthiness Division, FAA, to Margaret Jenny, President, RTCA, dated Oct. 7, 2014, transmitting FAA GPS/ABC Study.

<sup>9</sup> Letter from Margaret T. Jenny, President, RTCA, to Richard Jennings, Acting Assistant Manager, Design, Manufacturing and Airworthiness Division, FAA, dated April 21, 2015, transmitting RTCA SC-159 Summary Response to FAA, at 1 (Answer to Question #2 to RTCA).

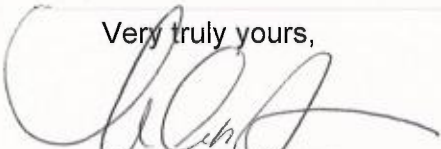
<sup>10</sup> Letter from Margaret T. Jenny, President, RTCA, to Richard Jennings, Acting Assistant Manager, Design, Manufacturing and Airworthiness Division, FAA, April 21, 2015, transmitting "LightSquared Responses to FAA Questions 1-3 to RTCA, Dated October 7, 2014," April 3, 2015. At page 11 of this transmitted report, LightSquared noted "[f]undamental philosophical differences remain between FAA and LightSquared regarding the overall modelling approach for all segments." RTCA responded as follows to LightSquared's report in transmitting SC-159's plenary-approved materials to the FAA: "Though perhaps appropriate for communication service analyses, LightSquared's preferred model would result in an unjustifiably low RF interference value (approximately 30- to 50-times smaller than the value given by the path loss model favored by the majority) at the aircraft GPS receive antenna from a given ATC base station. As such, the LightSquared path loss model has been deemed inappropriate for use in interference analyses of the aviation GPS safety applications." Letter from Margaret T. Jenny, RTCA, to Richard Jennings, FAA, April 21, 2015, at page 2, n.2.



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In this critical public safety and air safety issue, Garmin urges the FCC to look toward the FAA for establishment of the appropriate course to avoid harmful interference to certified aviation devices.

Very truly yours,



M. Anne Swanson